

BIOLOGY 5A (Section 001) – Fall, 2014

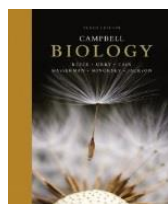
Introduction to Cell and Molecular Biology

Lectures MWF 10:10am-11:00am in LFSC 1500

Discussions M 8am, 9am W 6pm, 7pm and F 9am, 11am, 12pm, 1pm, 2pm, 3pm

Instructors: Dr. Morris Maduro and Dr. James Burnette

Week	Day	Date	Reading*	Lecture Topic	Lecturer
	F	Oct 3	Ch. 2	Introduction to Bio 5A; Atoms and Bonding	MM
1	M	Oct 6	Ch. 3	Atoms and Bonding continued; Water	MM
	W	Oct 8	Ch. 4	Carbon-based life, isomers, functional groups	MM
	F	Oct 10	Ch. 5	Biological Macromolecules I	MM
2	M	Oct 13	Ch. 5	Biological Macromolecules II	MM
	W	Oct 15	Ch. 5	Biological Macromolecules III	MM
	F	Oct 17	Ch. 7	Membrane Structure and Function I	MM
3	M	Oct 20	Ch. 6	Membrane Structure and Function II; Cell Structure I	MM
	W	Oct 22	Ch. 6	Cell Structure II	MM
	F	Oct 24	Ch. 8	Metabolism, Thermodynamics, Enzymes	MM
4	M	Oct 27	MIDTERM 1		
	W	Oct 29	Ch. 9	Cellular Respiration I	MM
	F	Oct 31	Ch. 9	Cellular Respiration II	MM
5	M	Nov 3	Ch. 10	Photosynthesis I	MM
	W	Nov 5	Ch. 10	Photosynthesis II	MM
	F	Nov 7	Ch. 16	DNA as the genetic material	JB
6	M	Nov 10	Ch. 16	DNA replication	JB
	W	Nov 12	Ch. 12,13	Mitosis and the cell cycle	JB
	F	Nov 14	Ch. 13	Meiosis: the chromosomal basis of inheritance	JB
7	M	Nov 17	Ch. 14 & 15	The genetic basis of inheritance: Crosses	JB
	W	Nov 19	Ch. 15	The genetic basis of inheritance: Linkages	MM
	F	Nov 21	Ch. 17	Transcription: Gene structure and expression	MM
8	M	Nov 24	MIDTERM 2		
	W	Nov 26	Ch. 17	Translation: Ribosomes and tRNAs	JB
	F	Nov 28	Thanksgiving HOLIDAY – No Lecture		
9	M	Dec 1	Ch. 17	Translation: The ribosome cycle	JB
	W	Dec 3	Ch. 17	Mutations and their consequences	JB
	F	Dec 5	Ch. 17	From gene to protein	JB
10	M	Dec 8	Ch. 18	Regulation of gene expression	JB
	W	Dec 10	Ch. 20	Genomics, Transcriptomics, Proteomics	JB
	F	Dec 12	Ch. 20	Final Exam Preparation	JB / MM
Final	W	Dec 17	FINAL EXAM: (11:30am-2:30pm, LFSC 1500)		



← Textbook: *Campbell Biology* 10th ed., by Campbell and Reece. (Older editions are fine.)

*Page numbers will be given later.

GRADING: Midterm 1 = 25%, Midterm 2 = 25%, Final = 40%, Discussion Quizzes and other assessments – 10%. *We will be using clickers in class, but we will not be awarding points for their use. Participation is strictly optional. Deadline for any grading disputes: 3-20-2015.*

The Biology 5A Concepts Quiz

Dr. Maduro – October, 2014

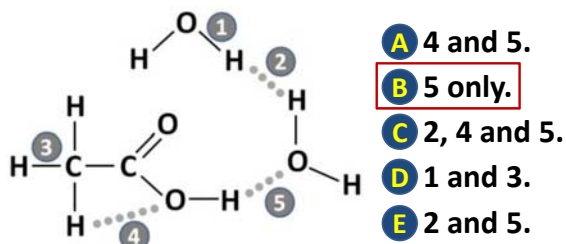
Complete this true-false quiz to assess your understanding of some of the concepts that will arise in Biology 5A. The answers are in a separate file. Do all the questions first before checking the answers.

TRUE or FALSE:

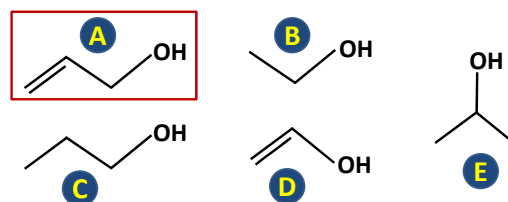
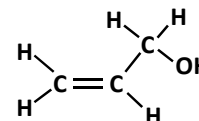
1. Two different isotopes of the same element differ in the number of protons in their atomic nuclei.
2. A "hydrogen bond" is a covalent bond formed between one atom and a hydrogen atom.
3. Everything in a cell is the product of particular genes, including carbohydrates and lipids.
4. All proteins made by eukaryotic cells get synthesized in the Endoplasmic Reticulum (ER) and packaged in transport vesicles.
5. Animal cells have mitochondria, but plant cells do not have mitochondria – they have chloroplasts.
6. Solutes and particles intrinsically want to move from a region of high concentration to a region of low concentration.
7. If a solute is able to pass through a membrane, then when the concentration becomes equal on both sides (i.e. at equilibrium), all solute movement will stop.
8. All enzymes use ATP when they catalyze chemical reactions.
9. Glycolysis, the process that produces pyruvic acid from glucose, requires oxygen.
10. In cellular respiration, electrons in glucose ultimately end up in ATP.
11. Most of the dry (non-water) mass of a plant, derived from sugars made in photosynthesis, comes originally from nutrients in the soil.
12. Plants take carbon from CO_2 and transfer it to water (H_2O) to make carbohydrates, $\text{C}_n(\text{H}_2\text{O})_n$. When plants remove the carbon from CO_2 , they release oxygen (O_2).
13. When a cell divides by mitosis, each daughter cell has half the number of chromosomes that the mother cell had.
14. When sperm and egg combine to make a new human zygote, the homologous chromosomes pair up and undergo crossing over to create the chromosomes of the new embryo.
15. Condensed chromosomes in mitosis look like an 'X' shape. One side of the 'X' is the chromosome from the mother, and the other side is the chromosome from the father.
16. The gametes of an organism are the same thing as its offspring (progeny).
17. If a heterozygous Pp plant makes gametes, then 75% of the gametes will be P and 25% of them will be p .
18. In Mendel's pea plants, the peas themselves are the gametes of a plant.
19. A dihybrid ($AaBb$) will make four types of gametes: A , a , B and b .
20. An $AaBb$ organism will make four types of gametes in the proportions 9:3:3:1.
21. "Independent assortment" of two genes means they affect different characters, like pea shape vs. color, so one phenotype (e.g. round vs. wrinkled shape) is not associated with the other (e.g. yellow vs. green).
22. A gene with a mutation does not have the structure of normal DNA: It has molecular damage to the DNA, such as a mismatched base pair, or extra covalently-added functional group.
23. All mutations damage the product of at least one gene, and prevent it from working.
24. If a cell puts the wrong amino acid into a protein during translation of an mRNA, a mutation will result.
25. Males and females are roughly 50/50 in the human population because of Mendel's Law of Segregation occurring in female meiosis.
26. If two unrelated humans are compared, they will have completely different genes. For example, the gene *BRCA1*, implicated in cancer, is found in only ~20% of people.
27. If the DNA sequence of the X chromosome from two unrelated males is compared, the sequences will be, at most, about 25-50% similar.
28. A particular *Neurospora* strain carries a mutation that prevents it from making the amino acid arginine. If arginine is supplied in the growth media, the mutation will get changed back into the normal gene, and the strain will now be cured.
29. In the very early development of an animal embryo, the embryo gets bigger as cells divide.

Biology 5A Clicker Questions 10 Oct 2014

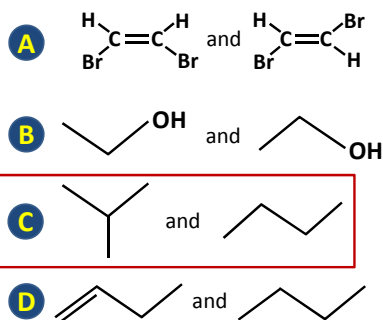
Which of these indicates a possible hydrogen bond?



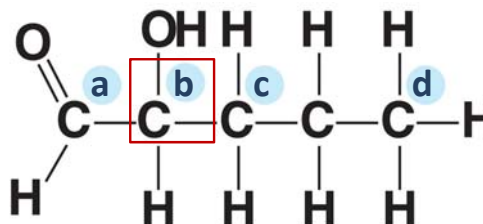
Which of the following is equivalent to this molecule?



Which of the following represents a pair of structural isomers?

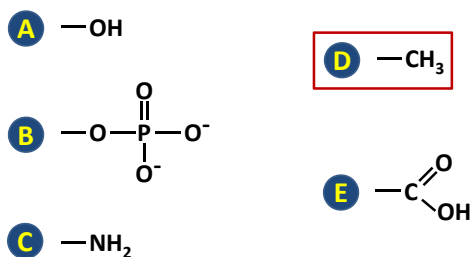


Which carbon is asymmetric, i.e. would cause the molecule to exist as two possible enantiomers?

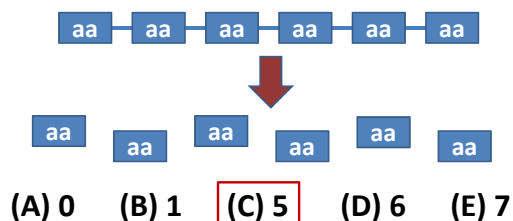


e None of the carbons are asymmetric.

Which of the following functional groups is the most hydrophobic?



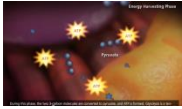
A polymer of six amino acids (aa) is converted into monomers by hydrolysis. How many molecules of water are consumed?



Biology 5A – Summer, 2014 - Dr. M. Maduro
Videos Shown in Lecture

The following are links to videos that are associated with particular lectures. It is possible that the instructor may not have time to show all of the videos listed here. Please let the course instructor know if any of these links is no longer valid.

Topic 8 – Cellular Respiration



https://www.youtube.com/watch?v=-Gb2EzF_XqA

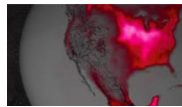
This video states that the number of ATPs produced per glucose is higher than what was stated in class. Please use the numbers we discussed (30-32 ATP/mol glucose) and which are in the textbook (9th edition and later).

Topic 9 – Photosynthesis



Photosynthesis

<https://www.youtube.com/watch?v=YeD9idmcX0w>



Chlorophyll Fluorescence from Space

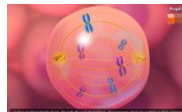
<https://www.youtube.com/watch?v=1XilneV3cJI>

Topic 11 – DNA replication and Mitosis (see Topic 17 too)



DNA Replication

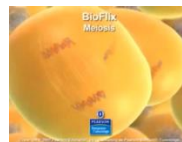
<https://www.youtube.com/watch?v=27TxKoFU2Nw>



Mitosis

<https://www.youtube.com/watch?v=JcZQkmooyPk>

Topic 12 – Meiosis



Meiosis (this video edited a bit from what was shown in class, but all important information is still present)

<https://www.youtube.com/watch?v=vA8aMpHwYh0>

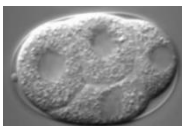
Topics 14-15 – Gene Expression (Transcription and Translation)



Molecular Biology of the Gene (shown over two separate lectures)

<https://www.youtube.com/watch?v=M568QP1K3sM>

Topic 17 – Stem Cells and Development



Time lapse of *C. elegans* Development (no audio)

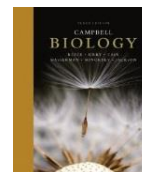
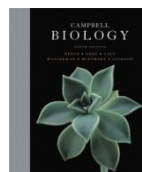
<https://www.youtube.com/watch?v=DXCy68ef5sA>



Time lapse of early Human Development (may also be shown in Mitosis lecture) (no audio)

<https://www.youtube.com/watch?v=UC0VZGZePXc>

The textbook edition changes every couple of years and Dr. Maduro's notes refer only to the current edition. This reference is for students to be able to follow which pages correspond in an older edition. Page numbers may not correspond directly between editions as some figures are changed or replaced, text is changed, and new figures are added. Sometimes a broader section of a chapter will be included to reflect that the coverage in the lecture has now included additional material.



Topic	Pages in 9 th Edition	Pages in 10 th Edition
(1) Atoms and Bonding	31-45	29-43
(2) Water	46-57	44-55
(3) Carbon-based Life, Functional Groups, Polymers	58-69	56-67
(4) Macromolecules	69-83; 86-90	68-82; 84-91
(5) Membranes	125-141, 770	124-140, 284
(6) Cell Structure	98-111; 123	97-112; 122
(7) Metabolism	11 (Fig. 1.13); 142-157; 160	141-161
(8) Cellular Respiration	163-181	162-184
(9) Photosynthesis	184-199; 203	185-200; 204-205
(10) DNA as the Genetic Material	305-312	312-320
(11) DNA Replication, PCR, Mitosis, Meiosis	312-317; 228-236; 248-259; 403-405	320-325; 414-415; 232-240; 252-266
(12) Monohybrid Crosses	262-270	267-276
(13) Genetic Linkage	288-291; 292-297	294-297; 299-304
(14) Transcription, Genetic Code	325-336	333-344
(15) Translation	337-343	345-354
(16) Mutations and their consequences	297-299; 317-318; 344-346	305-307; 325-326; 355-357
(17) Stem Cells and Development	413-417; 1035-1037	423-427; 1051-1053